

W6IFE San Bernardino Microwave Society Newsletter

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The 5 **February 1998** meeting tech talk will be Chip, N6CA on the loop yagi. SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1930 hours local time on the first Thursday each month.

Last meeting- Bill, WA6QYR presented information on how to determine of the compliant distances from your station antenna following the FCC rule change effective 1 Jan 1998. Thanks Bill for the data. Chip reported that the loop yagi antenna parts are in but he needs to sort them into kits. 14 members made it to the New Years day meeting. Where was everyone else that raised their hand?

Activity reported at the January meeting- Bill, WA6QYR finally got his CA3189/ LM386 chips in his wideband rig to settle down after moving the PC board into an RFI resistant box with feedthroughs. The LM 386 needed additional bypass to prevent it from oscillating and causing the CA3189 to open up and add more noise. Jeff KN6VR used 2.4 Ghz rigs for ATV at the Rose Parade with better results than the 450 and 900 Mhz gear of past years. Kurt, KA6RRA now has a 59" dish. Eric, KD6GLP has been working on 2 Ghz video equipment and the code. Al, K6LJM found a dog dish at WALMART that fits the back of the new 2' dishes and will make a nice support. Chip is working on plans for the 1.2 Ghz SBMS repeater. Ed, K6ODV tuned up some toroid circuits in his wideband rig.

1998 SBMS Annual Dinner 28 February- dinner will be at:

Vince's Spaghetti 8241 Foothill Blvd in Rancho Cucamonga, CA 91730, a family kind of place. Bring your spouse, or a friend. We plan to eat at 6 p.m. in the backroom. Talk in will be 147.30+ PL -123.0

For those of you with GPS- 34 deg 06.37 min North 117 deg 31.84 min West GRID SQUARE: DM14FC

from I-210 east: take hwy 30 to Foothill. Travel east past Euclid and Grove and the Magic Lamp Restaunt. Turn right into parking lot from Foothill just before Lowes Power Tools.

from I-10 east: exit Euclid. Go north on Euclid, turn right (east on Foothill), follow above directions from Euclid and Foothill to dinner.

from the high desert via I-15: south on 15 to Foothill. Exit Foothill. Go west past Vineyard to San

Bernardino Rd. Bear left onto San Bernardino Rd, turn right into parking lot after passing Lowes Power Tools (this can sneak up on you)

from I-10 west: exit Vineyard. Go north to Foothill. Turn left and travel west on Foothill. Follow above directions to dinner.

- Eric Fort <efort@www.fortconsulting.com> Thanks Eric for setting this up.

Scheduling

28 Feb. Annual SBMS dinner 6 p.m.- see write-up above

5 Mar. Doug , K6JEY rubidium standards

7 Mar The George QTH-QTH QSO event

2 Apr. Chuck, WA6EXV antenna measurements

Here is my program for waveguide slot antenna design as modified from the article by Stephen Bell, KB7TRZ in the Proceedings of the May 1995 West Coast VHF/UHF Conference in Cerritos, Ca, on Page 13 This version will run in QBasic, GW Basic, or BASICA. Let me know if you find any errors. 73s from Ed, W6OYJ "Robert E. Munn" <edmunnn@compuserve.com>

10 REM SLOTANT3 PROGRAM CALCULATES WAVEGUIDE ANTENNA DIMENSIONS

20 REM VERSION 1.3 OF 15 DEC 97

30 REM BASIC PROGRAM BY ED MUNN, W6OYJ

40 REM FROM ARTICLE BY STEPHEN BELL KB7TRZ IN WEST COAST VHF/UHF

50 REM CONFERENCE PROCEEDINGS CERRITOS CA MAY 1995, PAGE 13

60 REM

70 REM PROGRAM RUNS IN QBASIC, BASICA, OR GW BASIC

80 REM

90 REM

100 KEY OFF: CLS

110 PI = 3.14159

120 PRINT "SLOTANT3 PROGRAM CALCULATES SLOT DIMENSIONS FOR WAVEGUIDE ANTENNAS"

130 PRINT

140 PRINT "BASED ON ARTICLE BY STEPHEN BELL KB7TRZ IN 1995 WEST COAST VHF/UHF"

150 PRINT "CONFERENCE PROCEEDINGS."

160 PRINT

170 INPUT "ENTER NUMBER OF SLOTS DESIRED "; N

180 INPUT "ENTER INTERNAL WIDE DIMENSION OF WAVEGUIDE IN INCHES "; A

190 INPUT "ENTER INTERNAL NARROW DIMENSION OF W.G. IN INCHES "; B

200 INPUT "ENTER DESIRED OPERATING FREQUENCY IN MHZ "; FO

205 FO = FO / 1000: REM CONVERT TO GHZ

210 PRINT

220 A = A * 25.4: B = B * 25.4: REM CONVERT TO MM

230 WC = 2 * A: PRINT "W.G. CUTOFF WAVELENGTH IS "; WC; " MM"

240 FC = 300 / WC: PRINT "W.G. CUTOFF FREQUENCY IS "; FC * 1000; " MHz"

250 PRINT

260 WO = 300 / FO: PRINT "FREE SPACE WAVELENGTH IS "; WO; " MM"

270 WG = 1 / SQR(((1 / WO) ^ 2) - ((1 / WC) ^ 2))

280 PRINT "GUIDE WAVELENGTH IS "; WG; " MM OR "; WG / 25.4; " IN."

290 PRINT

300 G = 1 / N

310 G1 = 2.09 * (WG / WO) * (A / B) * COS(PI * WO / 2 / WG) ^ 2

320 Y = G / G1

330 AG = ATN(Y / SQR(1 - Y ^ 2))

340 X = (A / PI) * SQR(AG)

350 PRINT "SLOT OFFSET FROM CENTERLINE IS "; X; " MM OR "; X / 25.4; " IN."

360 LS = WO / 2

370 PRINT "SLOT LENGTH IS "; LS; " MM OR "; LS / 25.4; " IN."

380 SS = WG / 2

390 PRINT "SLOT VERT. CNTR-CNTR SPACING IS "; SS; " MM OR "; SS / 25.4; " IN."

400 WS = WG / 20:

410 PRINT "APPROX SLOT WIDTH IS "; WS; " MM OR "; WS / 25.4; " IN."

420 TS = SS / 2: PRINT "WAVEGUIDE END PLATE SHOULD BE AN ODD MULTIPLE OF"

425 PRINT TS; " MM OR "; TS / 25.4; " INCHES FROM END OF TOP SLOT."

430 END

Bill, Thank you for sending me a sample copy of SBMS Newsletter. Your article on the wavemeter was of great interest to me. Recently I bought just such an animal over the Internet. What you described is exactly what I got.

I am presently getting ready to fire up a 2K25 klystron that I was given. To that end I've had to build a suitable power supply (5Y3, 6X5 and three 0A2s). Next I've had to make my own WR90 waveguide from printed circuit board. Tonight I will attempt to make two horns from copper sheet. I'm also laboring on building a 1N23 detector mount. Why all this homebrewing??? Michigan is a total wasteland when it comes to microwave activity. The only things ham do here is to operate Japanese appliances. Boring, boring, boring, I say. Around here swaps have no microwave components. So, it's DIY. By the way, I'm tremendously impressed by your meeting turnouts and all the activity you guys are involved in. Again, thanks, Kurt Miska, N8WGW khm@tir.com

ARRL PACIFIC DIVISION UPDATE FEBRUARY, 1998 by Brad Wyatt, K6WR, Director, Pacific Division

New Features on the Pacific Division Website:- Thanks to Paul Wesling, KM6LH, Pacific Div. Webmaster and his crew, there are some new features on the Pacific Division website, at www.pdarrrl.org. The audio versions of the ARRL Letter and other newsletters are available using the Real Audio feature of the TAPR website. Many thanks to TAPR for providing this facility! The Vanity Calls section will be updated shortly to include recently

issued Gate 4 calls.

Call for New Ham Education:- Information on "How to Become a Ham," education books and materials,

instructors, etc., can be found by calling ARRL Educational Activities Department at 1-800-32NEW-HAM or by visiting the ARRL web site at <http://www.arrl.org>. On the web site look under the category of "How to

Become a Ham." There is a variety of ham education information available within the Pacific Division. Some selected sources are as follows: "One-on-one" code practice using MCW is on the KM6DZ repeater (146.655-) in Monterey after 9:00 PM Thursdays; KN6FR in Monterey teaches classes regularly; K5FO holds code practice on his web site at <http://reality.sgi.com/adams/>; Jack Carter, K4WRM, in Nevada City, will hold Novice and No Code Technician classes starting Jan. 28; No-Code Technician classes will be held by Tim Lyons, KF6LCH, in Ridgecrest, starting Jan. 22, by the Humboldt ARC in Eureka starting Jan. 12, and by Duncan Insley, WA6RRU, of Sierra Intermountain ARA in Minden, NV, starting Feb. 4.

From the January 1998 50 MHz and UP GROUP of northern California newsletter; "An attempt at new records for the 47 and 78 GHz records will be made soon by Lars Karlsson AA6IW, Will Jensby W0EOM, and Al Ward WB5LUA." PLANS FOR A GROUP STATION: "As our group is primarily devoted to experimental scientific research in VHF/UHF/Microwave communication techniques and propagation, we will build a club station in 1998 that will provide microwave EME capability for members. The long-term plans are to fully remote control it so that in the absence of contests, one might use it from your own house!" 73...jimw6asl@pacbell.net

73's Bill

A 5760 MHz Transverter by F1OPA

The 5.7 GHz transverter by Vincent Grigis, F1OPA was three articles in a special edition of Hyper, the French VHF and above newsletter. His address is 16 rue Eugene Delacroix, 38000 Grenoble, France. The articles were re-phrased by Bill, WA6QYR with the help of Marvin Bachman.

One article is on the construction of a 936 MHz source. It is an ovenized 117 MHz over tone crystal oscillator followed by a multiplier of 4 whose signal is filtered before going into a 2 times multiplier, a filter, and a final amplifier. Vincent indicates this multiplier circuit can be used for many projects. He is planning to build a similar unit for 10 GHz. The oscillator/ multiplier circuits are constructed on standard epoxy 1.6 mm thick printed circuit board. The board is designed to fit into a 109 mm x 34 mm x 30 mm box. It is important that the 3 ERA-3 MMIC's are properly ground to prevent oscillations. Vincent used vias to provide short ground paths. Figure 1 is the schematic followed by the parts list. Figure 2 is the printed circuit layout. Figures 3 and 4 show the placement of components.

Getting the over-tone oscillator to operate properly may take some coaxing. If adjusting L1 and checking the division ratio of C15 and C17 (should be a 1/3 relation) doesn't get it started, one may have to short the crystal and place the circuit to where it will oscillate on frequency with L1 in the middle of its tuning range. Then go back with the crystal in place and try again to make it operate properly. Once it is oscillating correctly, then bring the crystal up to temperature. One can bring the oscillator on to the precise frequency using C18.

In getting the first multiplier/ filter to operate properly, Vincent had to increase the size of C20 from the plan. The output impedance of IC2 and F1 may not agree with the catalog descriptions. Another thing that may need to be done is to place some RAM in the cover of the box to take care of any moding within the metal box. The circuit output is around +10 dBm. Lower harmonics were down 25 dB. One could use this circuit to build a marker source. Vincent used AutoCad Light 2.0 to design all the units here and file copies can be obtained from him.

The second article is on a 2 stage frequency multiplier used to take the 936 MHz 10 dBm signal from the first unit to 5616 MHz at +10 dBm. Again the Figures 5 through 8 provide schematic, parts list, printed circuit board etching and component placement. The same ERA-3 MMIC is used. This time the circuit is built on a new Rogers R04003 substrate that has a permittivity of 3.38 and a thickness of 0.8 mm. The board is to mount in a 72 mm x 34 mm x 30 mm case. As with the oscillator circuit, one needs to make sure the MMIC's are grounded with short leads using the vias (some people call them z wires). The filters are similar to the pipe cap construction used by US microwavers. Figure 9 gives the dimensions of the filter and brass tuning screw. I haven't checked to see if US pipe caps match the French company Castorama units. One needs to tin the pipe cap before soldering them to the board. Vincent uses a hot plate set for 300 degrees centigrade to lay the board and pipe cap on for a few minutes when soldering the cap to the board. Tune up is accomplished by applying the 936 MHz signal at +10 dBm to the input and monitoring the output. Adjust the cavity screw for maximum output. One may need to position a stub as shown in Figure 10 to get the optimum output. A circuit layout is also provided for building the circuit on Duroid (2.55 permittivity).

This transverter uses newer MMIC technology to have great performance and easy assembly. The receive chain has two amplifier stages, T1 and IC9 and one mixer buffer amplifier IC8. T1 has a resistor R5 in its drain to assure stability. The cavity (the same as the one in the multiplier circuit) in the receive circuit keeps the noise under control and the amplifiers make up for the cavity losses. A 10 mw local oscillator is required to drive the receive and transmit chains. A Wilkinson divider is used to split the LO between transmit and receive. The

transmit chain mixes the LO and 2 meter signals in a MMIC and then has two MMIC 5.7 GHz amplifier stages. Again cavity filters (PB1 and PB2) are used to filter undesirable signals and stay below amplifier compression points. A brass screw is used to tune the cavities on frequency. As before Figures 11 to 14 are used to show the schematic, parts list, printed wiring placement and component placement.

The transverter circuits are built on 0.79 mm thick Duroid printed circuit board material which has a permittivity of 2.55. The board was intended to fit within a 111 mm x 74 mm x 30 mm box.. All the components are standard with exception of C20 and 21 which are selected to make the circuit operate correctly. One needs to make sure the MMIC returns are properly grounded to prevent oscillations. Proper soldering of the cavities to the ground plane side of the board can be facilitated by placing the board on a hot plate for a few minutes at 300 degrees centigrade while solder is applied to the edges. T1 is fragile and care needs to be exercised to prevent static damage.

Vincent provided operating point data for the MMIC's in table 1. Plot 1 shows the input power to output power Vincent obtained with his unit. The 1 dB compression point is at 15 dBm. The LO signal was down 35 dB at the output.

You will need a signal source on 5760 MHz to adjust the stubs for T1 and IC8 for optimum operation (see Figure 15). Vincent used an HP8970A and HP346B to measure the receive noise figure at 1.65 dB with a gain of 20 dB. He used a hot/cold method of measurement with the set up in Figure 16 to come up with a noise figure of 1.78 dB. The differences in IF bandwidth account for the difference in values measured. The units seem stable. Vincent was able to place a 10 dB pad between the transverter and his 2 meter IF radio with only a few tenths of dB change in system noise figure, but was able to bring the 2 meter radio s-meter back to zero with no signal input.

So to summarize, Vincent has a transceiver with 15 dBm out put and noise figure of 1.7 dB and a gain of 18 dB. Vincent hopes his accomplishment helps increase the numbers of people on the band.